Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, DC 20554

In the Matter of	)	
	)	
Wireless Telecommunications Bureau and	)	WT Docket No. 24-240
Office of Engineering and Technology Seek	)	
Comment on NextNav Petition for Rulemaking	)	RM-11989
	)	

COMMENTS OF THE
Z-WAVE ALLIANCE

Avi Rosenthal
Chairman

Z-WAVE ALLIANCE
3855 SW 153rd Drive
Beaverton, OR 97003

September 5, 2024

Table of Contents

I. Introduction and Summary 1

II. Z-Wave Devices are Leading the Smart Home and IoT Revolutions Around the Country ... 4

  A. Proven and Broadly Deployed, Z-Wave Brings Affordable, Reliable, and Easy-to-Use "Smart" Products to Millions of People in Every Aspect of Daily Life 4

  B. Consumers Rely On Z-Wave Devices to Light, Power, and Protect Their Homes – and So Much More 7

III. Reconfiguring the Lower 900 MHz Band as NextNav Proposes Would Cause Irreparable Harm 9

  A. The Commission Should Take Care Not to Upset the Carefully Crafted Balance of Interests in the Band 9

  B. NextNav's Proposal Would Cause Unacceptable Interference, Severely Harming the Z-Wave Ecosystem 10

  C. The Harms Posed by NextNav's Proposal Cannot Be Mitigated 12

  D. NextNav's Proposal Would in No Way Benefit Z-Wave Alliance Members 13

IV. Conclusion 14

Technical Appendix 15

Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, DC 20554

In the Matter of	)	
	)	
Wireless Telecommunications Bureau and	)	WT Docket No. 24-240
Office of Engineering and Technology Seek	)	
Comment on NextNav Petition for Rulemaking	)	RM-11989
	)	

COMMENTS OF THE Z-WAVE ALLIANCE

The Z-Wave Alliance respectfully submits these comments in response to the Federal Communications Commission ("Commission" or "FCC") Public Notice seeking comment on the NextNav Inc. ("NextNav") petition for rulemaking requesting that the Commission initiate a proceeding to reconfigure the 902-928 MHz band ("Lower 900 MHz band") and adopt new rules to enable the deployment of a 5G terrestrial positioning, navigation and timing ("PNT") network.[1] The Commission should not move ahead with a rulemaking based on the Petition.

I. INTRODUCTION AND SUMMARY

Z-Wave®, which operates within the Lower 900 MHz band, is the most widely used wireless protocol for the smart home and Internet of Things ("IoT") industries. This open-source, interoperable, radiofrequency ("RF") technology is designed specifically for control, monitoring, and status reading applications in residential and commercial environments. Backwards compatibility is the cornerstone of the Z-Wave ecosystem, ensuring that all certified devices, regardless of their generation, can seamlessly communicate and function within the same network. Interoperability defines Z-Wave certification, providing consumers with confidence that their connected devices will work together today and in the future. As a result, the Z-Wave protocol leads the market in wireless control, bringing affordable, reliable, and easy-to-use "smart" products to millions of users in every aspect of daily life.

---

[1] Petition of NextNav for Rulemaking, WT Docket No. 24-240, at i (filed Apr. 16, 2024) ("Petition"); Letter from Robert Lantz, General Counsel, NextNav Inc., to Marlene H. Dortch, Secretary, FCC, WT Docket No. 24-240 (filed June 7, 2024) ("Petition Supplement"); *see also Wireless Telecommunications Bureau and Office of Engineering and Technology Seek Comment on NextNav Petition for Rulemaking*, Public Notice, DA 24-776 (WTB OET rel. Aug. 6, 2024) ("Notice").

The Z-Wave Alliance is the standards development organization dedicated to advancing and solidifying the Z-Wave technology platform as the standard for the development of wireless IoT devices for smart homes and buildings now and for the future. Z-Wave Alliance members are leaders in the residential and commercial connected device markets driving the smart home and IoT revolutions through technological innovation and award-winning products for virtually every residential application and many light commercial applications – all of which are based on Z-Wave. Members include startups and companies with a 20-year legacy of operating in the Lower 900 MHz band; those with thousands of currently deployed Z-Wave devices in the field, and those with millions of deployed devices. Members leverage the Lower 900 MHz band to provide secure, efficient, reliable device connectivity across a broad range of applications.

The Z-Wave Alliance has never commented at the FCC but does so now because the Alliance is deeply concerned by NextNav's proposal to reconfigure the Lower 900 MHz band in a way that jeopardizes the Z-Wave protocol in the United States. Historically, the FCC has balanced multiple interests in the Lower 900 MHz band, including those of industrial, scientific, and medical ("ISM"), unlicensed, federal radiolocation, and Location and Monitoring Service ("LMS") systems. As a result of such balancing efforts, unlicensed systems are used extensively in the band. Indeed, contrary to NextNav's assertions that the "Lower 900 MHz Band is underutilized,"[2] over 100 million Z-Wave devices have been deployed for daily use in more than 35 million homes and offices throughout the country.[3]

The NextNav proposal regarding 5G terrestrial PNT, if adopted, would only be successful if deployed ubiquitously across the country and extremely densely in top urban markets at high power.[4] This would adversely affect Z-Wave technologies by oversaturating the Lower 900 MHz band with RF traffic that would impede communications among millions of currently deployed Z-Wave devices. The result of introducing interference could potentially force Z-Wave Alliance members to stop designing devices for the Lower 900 MHz band altogether. Such actions would not only degrade the performance of existing devices but could also render any new devices incompatible with prior generations of devices, undermining the very essence of Z-Wave's commitment to a stable and reliable connected device experience. NextNav also proposes to remove the requirements in part 90 that protect unlicensed devices and ensure that part 90 devices are properly tested so that they do not cause unacceptable levels of interference to unlicensed devices, like Z-Wave devices. Combined, these changes would damage the Z-Wave ecosystem, including millions of devices on which Americans currently rely.[5]

For these reasons, the Z-Wave Alliance respectfully requests that the Commission reject NextNav's petition for a rulemaking and leave in place both the Lower 900 MHz band plan and the important protections for unlicensed devices, like Z-Wave devices, that have fostered the smart home and broader IoT revolutions.

---

[2] Petition at 17.

[3] *See* Z-Wave Alliance, *Technology Overview*, https://z-wavealliance.org/technology-overview/ (last visited Aug. 31, 2024); Silicon Labs, *Z-Wave Global Regions*, https://www.silabs.com/-wireless/z-wave/global-regions (last visited Aug. 31, 2024).

[4] *See generally* Petition at 21 (seeking to reconfigure the band to provide nationwide broadband); Petition Supplement (proposing rules that would, among other things, substantially increase the allowable power of NextNav's devices).

[5] *See* Z-Wave Alliance, *Technology Overview*, *supra* note 3.

II. Z-WAVE DEVICES ARE LEADING THE SMART HOME AND IOT REVOLUTIONS AROUND THE COUNTRY

Z-Wave devices, among many others, widely use the Lower 900 MHz band to deliver important, innovative services to businesses and consumers across the country. There are more than 4,500 certified Z-Wave products on the market today, and the revolution is continuing. The Z-Wave Alliance urges the FCC to preserve its existing framework for unlicensed devices in the Lower 900 MHz band to maintain this flourishing ecosystem for wireless devices.

A. Proven and Broadly Deployed, Z-Wave Brings Affordable, Reliable, and Easy-to-Use "Smart" Products to Millions of People in Every Aspect of Daily Life

The Z-Wave protocol is an interoperable, wireless, RF-based communications technology designed specifically for control, monitoring, and status reading applications in residential and light commercial environments. It operates between 908-916 MHz for standard Z-Wave[6] and 912-920 MHz for Z-Wave Long Range.[7] One of Z-Wave's many advantages is that it uses a lower frequency than common household wireless products such as Wi-Fi and Bluetooth. As a result, Z-Wave is not subject to common interference and congestion, making Z-Wave more reliable for mission-critical tasks and status. Further, backwards compatibility is a fundamental principle of Z-Wave certified products, ensuring that new devices will connect seamlessly with those already deployed.

---

[6] Silicon Labs, *Z-Wave Global Regions*, *supra* note 3.

[7] Z-Wave Alliance, *What is Z-Wave Long Range and How Does it Differ from Z-Wave?*, https://z-wavealliance.org/what-is-z-wave-long-range-how-does-it-differ-from-z-wave/ (last visited Aug. 31, 2024).

Z-Wave technology has evolved for over two decades and is now a ratified multi-source wireless standard for the development of IoT devices. Z-Wave was designed from the ground up for manufacturer-agnostic device-level control and is the most widely used wireless home control standard today.[8] The Z-Wave protocol provides both flexibility and reliability. Z-Wave technology assures interoperability across a manufacturer-agnostic ecosystem of more than 4,500 certified IoT devices, encompassing virtually every category and application. This allows both small entrants and established companies to participate in the connected marketplace.

The Z-Wave technology platform is both mature and yet still evolving to support new devices and use cases as well as allow new entrants. For example, among other recent developments, the Z-Wave protocol security framework meets, and in some cases exceeds, the regulations and requirements set forth by the recently announced U.S. Cyber Trust Mark.[9] Z-Wave's reliability and interoperability allow startups and small companies to develop and market smart devices that can seamlessly integrate into existing ecosystems, offering long-term value to customers. The ability to leverage Z-Wave as a stable, backwards-compatible, and feature-rich wireless communication standard is crucial to innovation by small businesses in the IoT space. Members want to continue to utilize and innovate on the platform.

As discussed further below, NextNav's proposal threatens to undermine this foundation by introducing interference and reconfiguring the available spectrum. Many Z-Wave devices rely on battery power, allowing them to be deployed in locations and use cases where it is impossible or highly inconvenient to connect to the power grid. Z-Wave uses highly efficient, low power chips that allow these devices, sensors, and more to operate on battery power for up to a decade. Such low-power chips are susceptible to high-power interference from an application like PNT. Even within the current rules, densely populated spaces such as apartment buildings with smart home, access, and security features require careful fine-tuning to ensure reliable operation. A high-power application permitted to operate in the same geographic area, as contemplated by NextNav, would make this use case impossible.

---

[8] Z-Wave Alliance, *Smart Security*, https://z-wavealliance.org/market_use_case/smart-security/ (last visited Aug. 31, 2024).

[9] News Release, Z-Wave Alliance, *Z-Wave Alliance Announces Support And Compliance With Latest Cybersecurity Labeling Programs For IoT Devices* (May 1, 2024), https://z-wavealliance.org/news_p/z-wave-alliance-announces-support-and-compliance-with-latest-cybersecurity-labeling-programs-for-iot-devices/; *see generally Cybersecurity Labeling for Internet of Things*, Report and Order and Further Notice of Proposed Rulemaking, FCC 24-26 (rel. Mar. 15, 2024).

Smart home businesses will not be able to survive the expense of reconfiguring their devices. The costs associated with relocating to a different spectrum band, if even feasible, would be prohibitive – especially for small- and mid-size members. That is, rather than competing in the marketplace to provide the best products and services, members may be forced out of the market due to regulatory decisions that create new technical challenges and increased costs. This would stifle innovation and reduce competition.

The technical mitigations required by NextNav's proposed reconfiguration would also directly increase costs for U.S. consumers, many of whom would be forced to upgrade or replace even newly purchased devices. The NextNav proposal would also require security system providers, custom integrators, and tech service companies to install and configure such new devices, thus adding an additional layer of expenses harming both consumers and small business owners. Z-Wave Alliance members conservatively estimate that the cost to security dealers alone to dispatch service technicians and replaces end devices would exceed hundreds of millions of dollars.

B. Consumers Rely On Z-Wave Devices to Light, Power, and Protect Their Homes – and So Much More

Although consumers are using Z-Wave technologies in thousands of different devices and use cases, Z-Wave Alliance highlights three use cases here.[10]

Smart Security. The vast majority of companies that manufacture smart security panels selected Z-Wave as their technology of choice. Ninety percent of the North American professionally monitored residential security companies use Z-Wave as their connected lifestyle solutions technology.[11] Z-Wave is the de facto standard for connecting smart devices to security systems; if NextNav's proposal is approved, millions of connected smart devices integrated into security systems nationwide will degrade and fail. In addition, security systems in over one hundred thousand North American bank branches use part 15 devices operating in the Lower 900 MHz band. The U.S. Secret Service uses Lower 900 MHz band sensors as part of executive protection security systems. Network reliability is critical to security applications; if the protections for unlicensed devices are removed from the Lower 900 MHz band part 90 rules, the safety and security of critical assets across the country will be put at risk.

Energy Management. Z-Wave allows consumers to monitor and control their energy consumption while serving as a wireless communications bridge between the home, utility, and smart grid. Z-Wave control empowers home systems and individual devices and power strips to operate with optimal efficiency. Smart climate, lighting, and window covering controls realize substantial cost savings each month for consumers. More importantly, Z-Wave provides the consumer with quantified data that lets them decide where and how to conserve costly household energy and build more efficient habits that save money and the planet.[12]

---

[10] Z-Wave Alliance, *Markets & Use Cases*, https://z-wavealliance.org/z-wave-markets-and-cases/ (last visited Aug. 31, 2024).

[11] Z-Wave Alliance, *Smart Security*, *supra* note 8.

Aging in Place. Accessible monitoring, control, and alert solutions powered by Z-Wave are making it possible for aging adults to stay safely in their homes longer. Z-Wave connected devices allow a new realm of security, convenience, and social features that empower independent and secure aging in place. Perhaps more importantly, they bring family caregivers new abilities to stay intimately connected, even when they cannot physically be there, creating the most mutually secure and comfortable environment possible for independent aging.[13]

Consumers using Z-Wave assistive technologies, including seniors and those with disabilities, are disproportionately vulnerable to NextNav's proposal. These consumers rely on Z-Wave devices not just for convenience, but for safety and independence. NextNav's proposal could lead to debilitating service disruptions for assistive device networks, jeopardizing the safety and independence of vulnerable populations. Backward compatibility is especially important for assistive technologies because users are disproportionately likely to be on a fixed income, and therefore less able to afford frequent device updates. Any technological mitigation of NextNav's proposal would lead to reduced reliability, increased costs, widespread device incompatibility, or all of the above for these critical device networks.

Americans rely on IoT devices more today than any time in history, and the Z-Wave Alliance anticipates that this trend will continue within the current FCC framework. Homeowners and renters rely on Z-Wave devices to unlock their doors, turn on their lights, and control their energy usage. Americans with disabilities use Z-Wave assistive technologies to automate their homes and monitor their health, enriching their lives with safety, independence, and dignity. These are the applications that NextNav seeks permission to interfere with at an "unacceptable" level; allowing them to degrade and fail would be unacceptable to the millions who rely on them.

---

[12] Z-Wave Alliance, *Energy Management*, https://z-wavealliance.org/market_use_case/z-wave-powers-energy-management-solutions/ (last visited Aug. 31, 2024).

[13] Z-Wave Alliance, *Connected Aging*, https://z-wavealliance.org/market_use_case/connected-aging-2/ (last visited Aug. 31, 2024).

III. RECONFIGURING THE LOWER 900 MHZ BAND AS NEXTNAV PROPOSES WOULD CAUSE IRREPARABLE HARM

Reconfiguring the Lower 900 MHz band as NextNav proposes would harm the Z-Wave ecosystem, hundreds of businesses, and millions of consumers with Z-Wave devices. As described below and in the attached Technical Appendix, NextNav's proposals to change the structure of the Lower 900 MHz band and eliminate protections for unlicensed devices will upset the balance that the FCC has long endeavored to promote in the band, causing irreparable harm. Indeed, the current framework has led to extensive use by unlicensed services, fostering development and innovation that has ultimately benefitted consumers.

A. The Commission Should Take Care Not to Upset the Carefully Crafted Balance of Interests in the Band

The NextNav proposal would upend longstanding Commission efforts to balance multiple interests in this band, including ISM, unlicensed, federal radiolocation, and LMS services.[14] The Commission's regime has been successful, and unlicensed systems are used extensively in the band along with part 90 devices and other uses.[15]

NextNav's proposed service must be ubiquitously deployed if it is to be commercially successful, thus ensuring compatibility issues with unlicensed systems that have already been widely deployed. The entire purpose behind the NextNav proposal is to attract mobile broadband providers to pursue the band for providing mobile broadband services to commercial customers, and thus fund the buildout of NextNav's proposed PNT network.[16] This would make the new broadband/PNT service ubiquitously available anywhere that cell phones are typically used. This means blanketing service areas with high-power signals to provide the desired broadband service. The increased demand for bandwidth would then cause many of the Lower 900 MHz band's current unlicensed users to instead shrink their spectrum footprint to the 11 MHz of spectrum that would be limited on non-multilateration LMS under the NextNav proposal.[17] This increased user density in the remaining spectrum would lead to increased congestion and contention in that portion of the band. NextNav's proposal to eliminate both FCC testing requirements and the prohibition against causing unacceptable interference would even further undermine the numerous systems already built out in the band.

---

[14] *See* Notice at 1 (citing *Amendment of Part 90 of the Commission's Rules to Adopt Regulations for Automatic Vehicle Monitoring Systems*, Report and Order, 10 FCC Rcd 4695 (1995)).

[15] *See, e.g.*, *id*. at 4.

Consumers purchase Z-Wave products with the reasonable expectation that they will continue to function for years. If the Lower 900 MHz band is reconfigured, their products will no longer function as desired or advertised, and they will be left no recourse.

B. NextNav's Proposal Would Cause Unacceptable Interference, Severely Harming the Z-Wave Ecosystem

NextNav's proposal to cause "unacceptable interference" to Z-Wave devices would devastate the Z-Wave ecosystem and cause significant disruption to critical applications that cannot be readily remedied.[18] In addition, limiting the use of the Lower 900 MHz band by squeezing unlicensed users would have adverse consequences for currently installed systems.

---

[16] Petition at 22 (proposing to "provide terrestrial PNT based on a 5G broadband deployment").

[17] *Id*. at 28 (proposed band plan).

The removal of testing requirements would give NextNav free rein to saturate the Lower 900 MHz band with high-power traffic, drowning out low-power signals from millions of currently deployed devices.[19] Such a decision would render the vast existing ecosystem of smart home and IoT devices essentially useless. However, even if testing requirements remain in force, deprecation of the Lower 900 MHz band for IoT device connectivity is the inevitable outcome of NextNav's proposal. Their application use case requires dense deployment of high-power signals. Testing would only verify that a functional terrestrial PNT system, expressly designed to work indoors and out, would make it impossible for other IoT devices to communicate effectively in the same frequency band.

The interference caused by NextNav's proposed use case would be a slow-moving disaster. With no certainty that their devices would be able to operate, manufacturers would cease innovation and development in this band. As interference from NextNav's signals increased, the performance and range of existing Z-Wave devices would degrade to the point of uselessness – long before their expected device lifespan expired. Consumers would not understand why their security sensors or thermostats had stopped working: only that they did, and that no backwards-compatible replacements were available.

---

[18] *See* Petition Supplement at A-6, A-11 (seeking removal of the current requirement prohibiting NextNav from causing unacceptable levels of interference to part 15 devices).

[19] Notice at 4 (seeking comment on the effect of the "elimination of the testing requirements of current rule section 90.353(d)" on Z-Wave devices).

C. The Harms Posed by NextNav's Proposal Cannot Be Mitigated

Accommodation in other spectrum bands is untenable.[20] The Z-Wave ecosystem is specific to the Lower 900 MHz band, and for good reason. The Lower 900 MHz band is a critical alternative to smart home devices that operate via Wi-Fi and Bluetooth. Other open bands are already too congested to accommodate the traffic of the Z-Wave devices and other part 15 devices currently operating in the Lower 900 MHz band. The higher frequency range of these alternative bands makes them both less efficient and less capable of penetrating building materials. Many Z-Wave devices are installed deep in a building's infrastructure and remain in place for up to a decade. Relocation of an entire device ecosystem to a different open spectrum band would reduce their range and battery life, rendering them useless even if replaced. Further, this migration would eliminate the backwards compatibility that currently exists among Z-Wave devices. As a local networking protocol, Z-Wave allows users to create secure smart home and building networks that do not share data with advertisers, retailers, or the cloud. If this frequency band disappears as an option, consumer choice and privacy will drastically shrink.

The cost of relocation is significant.[21] Given the expansive research, development, labor hours, downtime, and production that an ecosystem migration would require, the total cost of relocation is nearly impossible to calculate. Z-Wave Alliance members would have to recertify their Z-Wave products, even where development costs have not yet been amortized, resulting in both administrative burden and unnecessary expense for members and the Z-Wave Alliance alike. The Z-Wave Alliance conservatively estimates that the cost of such a move as hundreds of millions of dollars, and many U.S. startups and small and medium-sized businesses would be forced to shutter rather than shoulder it. NextNav proposes a policy that risks crippling innovation in a relatively new and rapidly expanding market.

---

[20] *See id.* (asking commenters to discuss whether services provided by part 15 devices in this band can be accommodated in other spectrum bands).

[21] *Id.* (seeking comment on the costs for relocation and how long relocation would take).

NextNav has made no effort to mitigate Z-Wave member concerns.[22] Despite assurances by NextNav to "work with" unlicensed users,[23] the Z-Wave Alliance is unaware of any member contacted by NextNav to better understand their spectrum usage and requirements. And, the Z-Wave Alliance has similarly not received any outreach.

D. NextNav's Proposal Would in No Way Benefit Z-Wave Alliance Members

Z-Wave, under the current band plan, is a thriving ecosystem with widespread active device development. NextNav's proposed rule changes are not only unnecessary[24] – they are harmful. No Z-Wave Alliance member would benefit from the implementation of this proposal, and many would never recover.[25] The costs and harms to device makers and consumers are numerous.

For instance, hardware devices would require a new antenna to cover a different frequency spectrum, necessitating physical re-design and replacement. In addition, many of the Z-Wave devices that would require redesign are new, and their development costs are not yet amortized. Manufacturers would meanwhile be unable to use current developments as a base for device replacements, necessitating incalculable research and development efforts to redesign over 4,500 certified Z-Wave devices from the ground up. Performance degradation caused by interference from PNT applications would cause significant reputational harm to current IoT device manufacturers, depressing future customer demand. While manufacturers rushed to redesign key products, production capabilities would be curtailed. Many Z-Wave devices are installed in occupied spaces such as apartments and offices such that the replacement process would disrupt the occupants' lives and businesses as well as cost device owners' resources.

---

[22] *Id.* (indicating that NextNav "will work with unlicensed users to understand their spectrum requirements," and seeking comment on the status of outreach with part 15 device users and amateur licensees).

[23] Petition at 30-31.

[24] For example, both NextNav and the Notice identified current work to develop and fund (with government dollars) PNT alternatives. *See* Petition at 7; Notice at 3.

[25] Notice at 4 (seeking comment on costs to consumers, as well as "the costs and benefits involved in implementing the proposed band plan, including the impact on incumbents in terms of relocation or protection").

In sum, NextNav's proposed rule changes are antithetical to the continuous operation of millions of connected devices currently operating in the Lower 900 MHz band. Additional or revised rules would be unlikely to remedy the proposal to such an extent that Z-Wave and other existing unlicensed users could continue to operate in the reconfigured spectrum.[26]

IV. CONCLUSION

For the foregoing reasons, the Commission should reject NextNav's Petition. The FCC's longstanding approach to unlicensed devices in the Lower 900 MHz band has facilitated a vibrant and growing ecosystem in unlicensed devices and specifically in home automation. Undermining this innovation by reconfiguring the band or removing important protections will harm hundreds of businesses, millions of consumers, and the overall industry.

Respectfully submitted,

Z-WAVE ALLIANCE

By: */s/ Avi Rosenthal*
Avi Rosenthal
Chairman

3855 SW 153rd Drive
Beaverton, OR 97003

September 5, 2024

---

[26] *Id*. at 4 (asking commenters whether "NextNav's proposed rule changes adequate," or if additional or revised rules are required).

TECHNICAL APPENDIX

The Z-Wave Alliance provides the following technical analysis of the effect of NextNav's proposed PNT/5G network would have on Z-Wave Alliance-certified devices.

Z-Wave Devices Are Long-Lasting, Low-Power Devices with Short Duty Cycles.

Z-Wave devices were designed to leverage the spectrum environment the Commission established for the Lower 900 MHz Band, with its balanced approach to multiple uses. Indeed, the characteristics of Z-Wave devices that have led to their success in the IoT and automation ecosystems make them vulnerable under NextNav's proposed vision for the band:

- Z-Wave devices in the United States operate in portions of the Lower 900 MHz Band that are both within NextNav's proposed broadband band plan, and within the 907-918 MHz portion that NextNav proposes to leave for all other users currently in the Lower 900 MHz Band.

- Z-Wave devices are designed with sensitivity levels as low as -100 dBm, which permits effective deployment in low-RF-noise environments.

- Z-Wave devices typically have very low duty cycles, often less than 1%, due to their brief and infrequent transmissions.

- Z-Wave devices often have long device lifespans/battery life allowing their deployment in hard-to-reach places such as the interior or below buildings and for several years.

- Z-Wave devices typically use omnidirectional antennas to ensure widespread coverage in home and building environments. Z-Wave devices cannot focus their signals away from sources of interference.

- Z-Wave devices are widely deployed in various environments, such as residential homes and commercial buildings, including high-density areas, such as multi-unit dwellings. Multi-unit dwellings and dense urban environments can act as "hotspot" areas for Z-Wave device deployment due to the higher concentration of devices, meaning these areas are particularly vulnerable.

In the present spectrum environment, safeguarded by the present rules, Z-Wave devices avoid and mitigate interference through low-power operation, short transmission durations, and unique coding to differentiate between systems. Z-Wave devices do not utilize spread spectrum techniques like frequency hopping or direct sequence. As a result, Z-Wave devices are particularly vulnerable to continuous or burst interference, which the NextNav proposal could introduce. The result could be a significant degradation in the quality of service and reliability of Z-Wave network.

NextNav's Higher Power, Long-Duty Cycles, and Density Would Create Unescapable Harmful Interference

NextNav is proposing power levels that are significantly higher than currently permitted in the 902-928 MHz band. LMS systems are currently limited to 30 Watts ERP.[27] NextNav has proposed base station power levels up to 2000 Watts/MHz ERP in rural areas.[28] NextNav has further proposed that its downlink would use a 10 MHz channel, meaning the total maximum transmit power limit would be 20,000 Watts in rural areas and 10,000 Watts in non-rural areas. These proposed power levels are more than 300 times the power currently permitted in the 902-928 MHz band in urban areas, and more than 600 times in rural areas. NextNav's proposes to allow mobile broadband providers to build out base stations that would blanket areas with signals sufficient to provide viable broadband service to mobile customers. This type of deployment ensures that signals sufficiently high to cause harmful interference to other users of the Lower 900 MHz Band will be ubiquitously distributed within any area where users expect their cell phone to work, including homes and businesses where Z-Wave devices are typically deployed. Even if NextNav were not to deploy base stations as densely as anticipated, NextNav's proposed base stations would exceed the sensitivity level of Z-Wave devices even when located many kilometers away, causing interference.

The NextNav proposal will lead to frequent or even continuous interference, which will cause Z-Wave devices' brief transmission windows to be consistently disrupted. As noted above, the antennas on Z-Wave devices are omnidirectional and have very limited abilities to switch channels to avoid interference. In Z-Wave Long Range (LR), there are only two channels available for use, and in classic Z-Wave, there is only one channel. If the NextNav proposal leads to widespread interference, Z-Wave devices may find themselves with no viable channels left to switch to. This could result in complete communication breakdowns in affected areas, further compromising the safety, reliability, and effectiveness of these systems, particularly in critical environments where dependable communication is essential. Indeed, the increased interference could overwhelm the devices, leading to widespread system failures, particularly in densely populated areas.

In addition, the built-in retransmission mechanisms within Z-Wave devices would increase repeat transmissions to attempt to maintain communication integrity. This increased traffic would severely decrease the battery life of these battery-operated devices, leading to more frequent battery replacements and potentially rendering some devices unusable, especially in critical applications like home security. Z-Wave devices in the United States operate on 908.42, 912, 916, and 920 MHz. NextNav's proposal is a threat to Z-Wave devices in both co-channel scenarios as well as adjacent channel scenarios, either of which could severely impact the functionality of Z-Wave networks, especially in safety-critical applications.

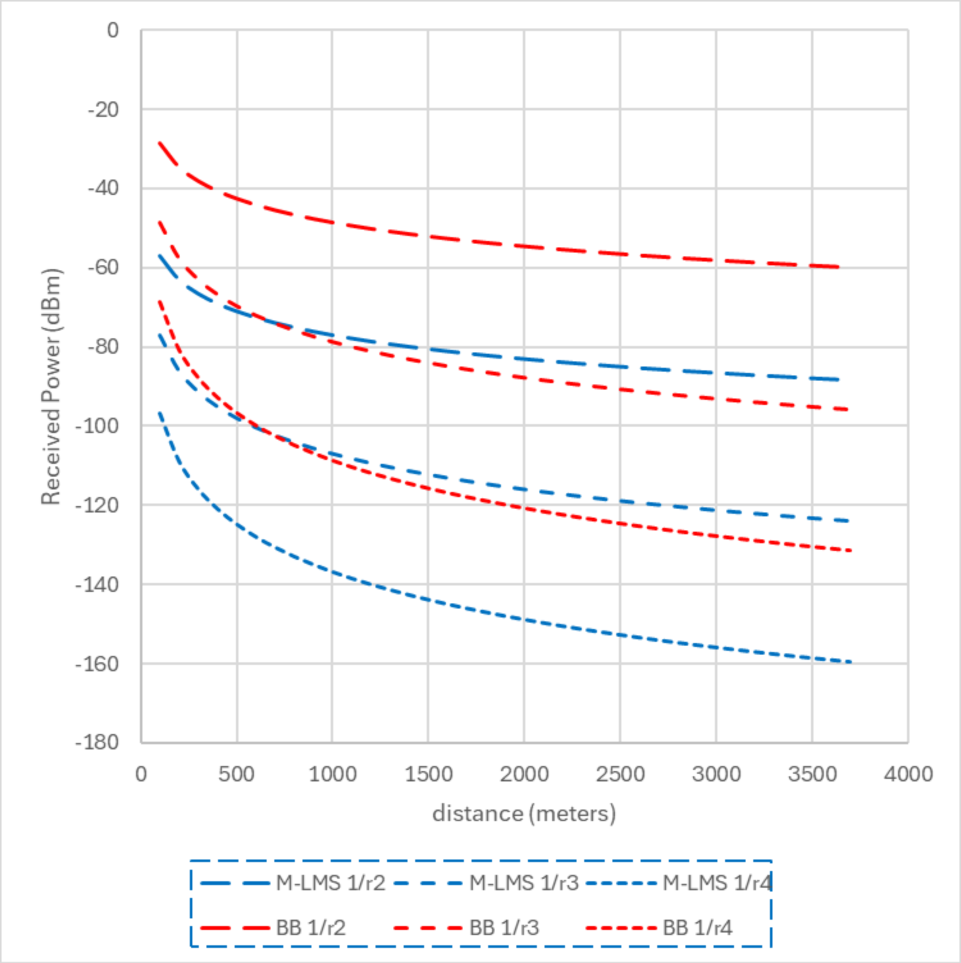
Current FCC rules limit M-LMS power to 30 W ERP. The NextNav proposal would permit up to 20,000 W ERP for a 10 MHz channel (a 28.2 dB difference). This means that a proposed base station that is much further away can have the same or even greater interference impact on unlicensed operations as a base station operating under the current M-LMS rules.

---

[27] 47 C.F.R. § 90.205(l).

[28] Petition Supplement at A-10.

Figure 1 below shows the significant increase in interfering signal levels that will be encountered in the field from NextNav's proposed broadband base stations as compared to M-LMS stations permitted under the FCC rules today. The blue lines show received interference levels from M-LMS base stations assuming free space propagation ($1/r^2$), and also impaired propagation ($1/r^3$, and $1/r^4$) such as might be found at indoor residential environments. The red lines show the interference levels expected from NextNav's broadband stations using the same propagation assumptions. The data clearly indicate that base stations several kilometers away will have increased potential to cause harmful interference to Z-Wave devices as compared to conventional M-LMS stations. In addition, the potential for harmful interference from mobile devices using the 902-928 MHz band would be even higher, since the separation distance between a mobile device and a Z-Wave device could be much smaller.



Z-Wave devices currently co-exist with myriad other uses of the Lower 900 MHz Band, and the Z-Wave Alliance anticipates that NextNav's proposed band plan will lead *all unlicensed operations* currently in Lower 900 MHz Band to migrate into the remaining 907-918 MHz range portion to escape persistent interference from NextNav's broadband service. This migration will result in severe and persistent disruptions to existing Z-Wave devices.

As noted above, Z-Wave devices avoid and mitigate interference through low-power operation, short transmission durations, and unique coding to differentiate between systems.

However, these measures are insufficient against the persistent interference that the NextNav proposal would cause. Z-Wave devices' typical omnidirectional antennas are vulnerable to disruption by ubiquitously deployed high power base stations such as NextNav proposes. Although the use of directional antennas could potentially be useful for mitigating interference to Z-Wave devices, directional antennas are not practical for IoT devices like those using Z-Wave, as they limit flexibility in antenna placement and reduce the ability to communicate with IoT devices in multiple directions. The introduction of additional noise and interference by the NextNav proposal could severely disrupt Z-Wave device performance, as these devices lack antenna discrimination to reduce the interference from widely dispersed sources of interference such as NextNav proposes.

NextNav also proposes to remove the FCC rule requiring that it consider compatibility with other users, ensuring that the few protections in place are removed. By increasing the risk of harmful interference, and removing the protections afforded by the FCC rules, NextNav would destroy the thriving unlicensed operating environment, and chill any future investments in unlicensed technology and applications.